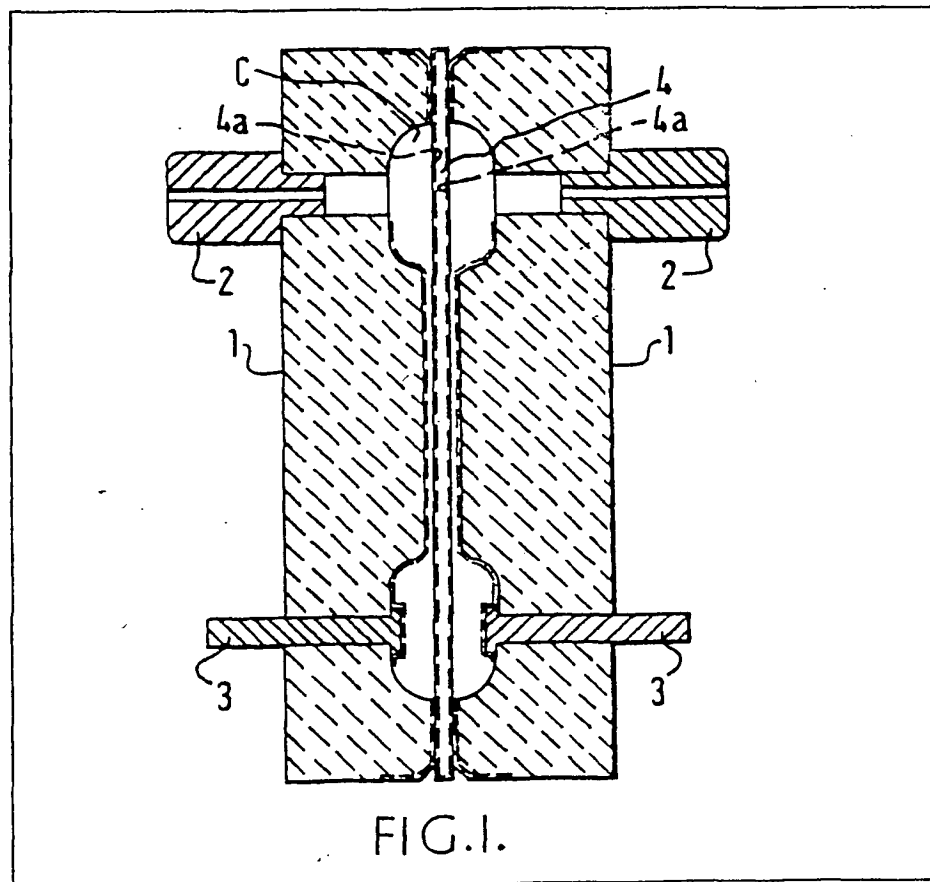


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- (54) Differential capacitance pressure
transducer
(57) A differential capacitance pressure

transducer comprises a resilient diaphragm (4) which is sealingly supported between a pair of body components (1) made of high alumina ceramic material which together define a pressure chamber divided by the diaphragm. The diaphragm (4) is made of high alumina ceramic material or glass and the opposite adjacent surfaces of the body components are apertured 2 to enable a differential fluid pressure to be applied to the pressure chamber on each side of the diaphragm; electrodes 3 extend into the body components to make contact with coatings of electrically conductive material on the body components. These electrodes and metal layer 4a on the diaphragm are intended to be connected to an alternating current measuring circuit to enable changes in transducer capacity and hence changes in differential fluid pressure to be indicated and/or recorded.



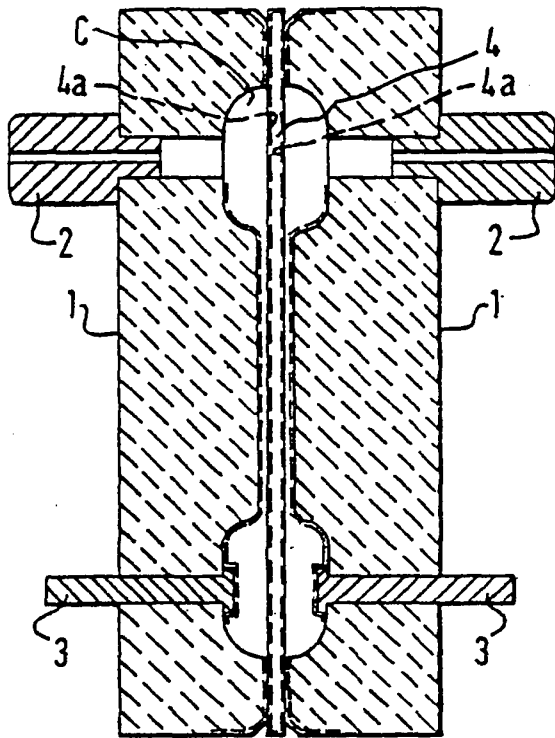


FIG. 1.

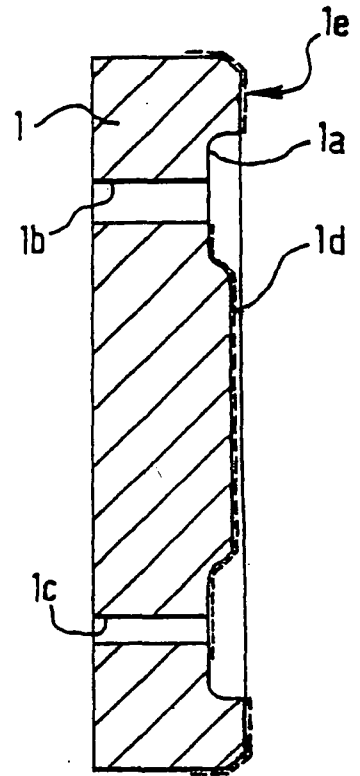


FIG. 3.

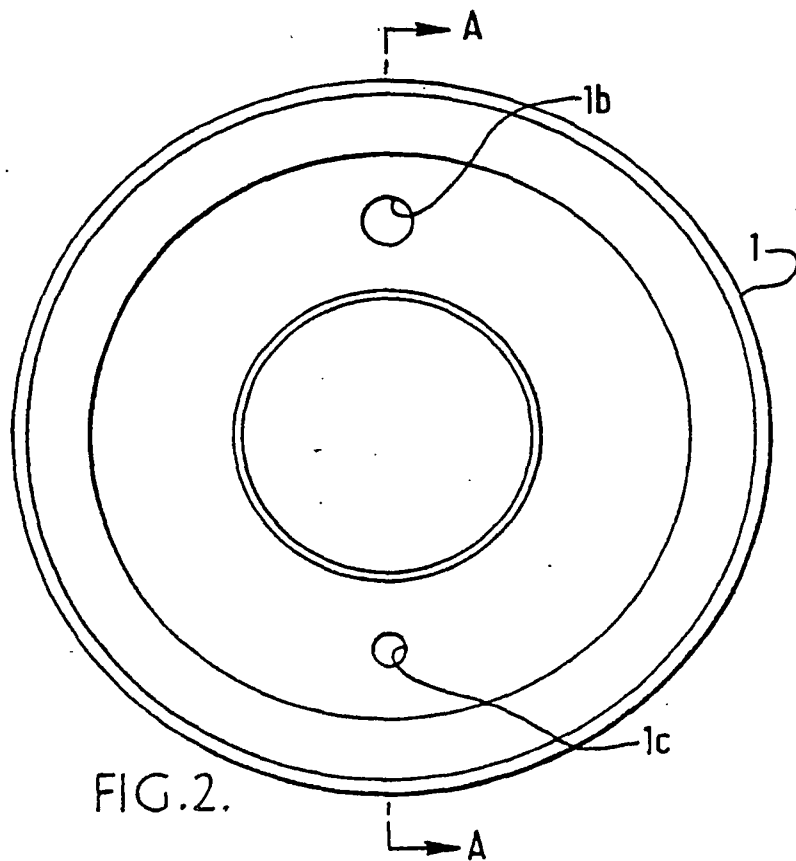


FIG. 2.

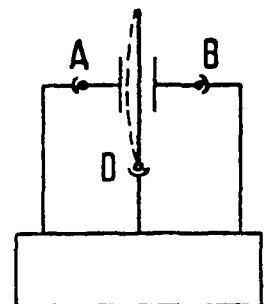


FIG. 4.

SPECIFICATION

Differential capacitance pressure transducer

5 This Invention relates to a Transducer which is adapted to measure differential fluid pressures or variations therein through the medium of electrical capacitance or changes thereof.

10 In accordance with the invention a differential capacitance pressure transducer comprises a resilient diaphragm which is sealingly supported between a pair of body components made of high alumina ceramic material which together define a pressure chamber divided by the diaphragm, the
15 diaphragm being made of high alumina ceramic material or glass, the opposite adjacent surface of the diaphragm and the body components being coated with an electrically conductive material, the body components being apertured to enable a
20 differential fluid pressure to be applied to the pressure chamber on each side of the diaphragm, and electrodes extending into the body components to make contact with the metal coatings thereof.

The electrodes and the metal coated part of the
25 diaphragm are intended to be connected into an alternating current measuring circuit by which changes in capacitance of the transducer caused by deflection of the diaphragm under differential pressure can be detected and measured as an indication
30 of such pressure or changes thereof.

A preferred embodiment of the invention is illustrated in the accompanying drawings in which:-

Figure 1 is a cross-section in a plane containing the central axis of the transducer.

35 *Figure 2* is an end view of a transducer body component;

Figure 3 is a cross-section on line A-A of *Figure 2*; whilst

40 *Figure 4* shows the mode of connection of the transducer into an A.C. bridge network, this being one of many types of alternating current measuring circuit.

Referring now to the drawings the differential capacitance pressure transducer essentially comprises a pair of body components 1 each in the form of a circular disc made of high alumina (90% and above) ceramic material. One example which proved to be satisfactory utilized 97.5% Alumina. The discs 1 are identical and have an annular recess 1a in one
50 face, a bore 1b for accommodating a metal pressure port connector 2, and a somewhat smaller diameter bore 1c for accommodating an electrode pin 3. The central part of the recessed side of each disc 1 has a coating 1d of electrically conductive material indicated by a chain line in *Figure 1* and with which an electrode pin 3 is intended to be connected.

The outer peripheral part of the recessed side of each disc 1 has a similar coating 1e of electrically conductive material indicated by a chain line in
60 *Figure 1*. The coating 1e is used to provide electrical contact with the diaphragm coating 4a to enable a ground connection to be made (letter D *Figure 4*) when the two discs 1 and diaphragm 4 are assem-

form of a simple circular disc 4 which is sandwiched between the body component discs 1 and adhesively secured thereto in a fluid-tight manner. This diaphragm 4 is also made of a high alumina ceramic material or glass and has on each side an electrically conductive coating 4a. As can be seen from *Figure 1*, the diaphragm 4 extends centrally across a chamber C formed between the annular recesses 1a of the body components and their spaced parallel central parts. Both faces of the diaphragm are coated with an electrically conductive layer and these layers constitute a movable electrode the diaphragm being resiliently deformable as a consequence of different pressures prevailing in the parts of the chamber adjacent its respective sides so as to vary the capacitance of each side of the transducer.

Various adhesives may be used for securing the interfaces of the body components and the diaphragm. One such adhesive is a cyanoacrylate.

85 One method of assembly entails the clamping of the body components 1 and diaphragm 4 together in a manner which provides pressure contact between the electrically conductive coatings 1e and 4a, and whilst maintaining this clamping pressure an application of cyanoacrylate is provided around the circumferential joints. In some instances, the application of a sealant around the circumferential joints may be required in addition.

Figure 4 shows the mode of connecting (A,B) to the metallic coatings 1d of the respective body components and (D) the metallic coating 4a of the diaphragm into an A.C. Bridge Network. As will be appreciated when the diaphragm 4 moves into the position shown by the dashed lines as a consequence of a change in differential pressure acting thereon, there will be a measurable change in the capacitances of the transducer which can be indicated and/or recorded.

The sensitivity of transducers as above described can be determined by performance of a test in which
105 a fluid pressure is applied to each side of the transducer in turn whilst the capacitance of both sides of the transducer is measured. The capacitance of each side for a given pressure - e.g. 10"W.G. or 2500 Pa - is then compared with the zero differential pressure capacitance. The difference between the zero differential pressure reading and the 10"W.G. pressure reading can then be expressed as a percentage of the zero differential pressure reading for each
115 side in turn. This percentage change in capacitance represents the sensitivity of the transducer.

Sensitivity is mostly dependent upon:-

120 (a) the initial capacitance of the transducer at zero differential pressure, and (b) the tolerance on diaphragm thickness.

When the initial capacitances are high, the sensitivity (percentage change in capacitance) is high.

When the diaphragm thickness is at its lower limit, the sensitivity is greatest.

CLAIMS

1. A differential capacitance pressure transducer

- made of high alumina ceramic material which together define a pressure chamber divided by the diaphragm, the diaphragm being made of high alumina ceramic material or glass, the opposite
- 5 adjacent surfaces of the diaphragm and the body components being coated with an electrically conductive material, the body components being apertured to enable a differential fluid pressure to be applied to the pressure chamber on each side of the
- 10 diaphragm and electrodes extending into the body components to make contact with the electrically conductive coatings.
2. A differential capacitance pressure transducer in accordance with Claim 1 in combination with an
- 15 Alternating Current measuring circuit into which the said electrodes and the electrically conductive coating on the diaphragm are connected.
3. A differential capacitance pressure transducer constructed substantially as hereinbefore described
- 20 with reference to, and as shown in, the accompanying drawings.